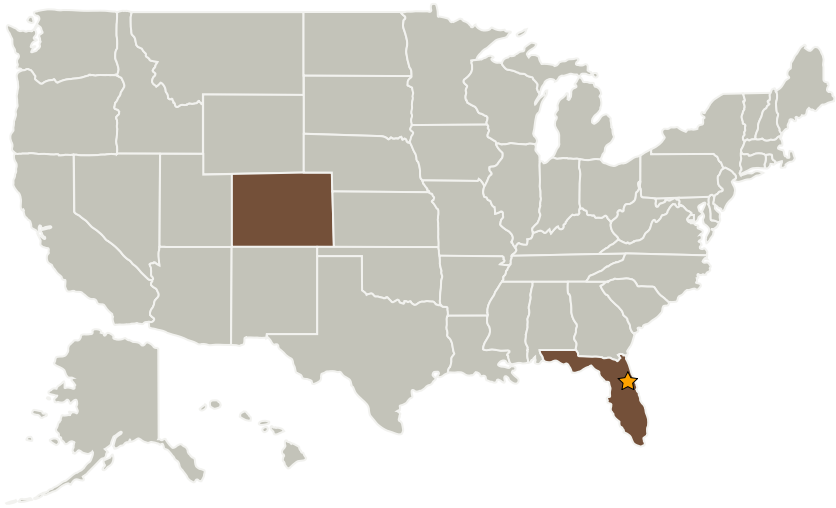
Advanced Granular System Modeling, Phase I

Completed Technology Project (2007 - 2008)

Project Introduction

Spaceports of the future will utilize new granular materials in unique applications including insulation for cryogenic tanks and Lunar regolith processing for usable resources. New granular insulation materials such as microspheres provide the opportunity to construct and operate safe and energy-efficient cryogenic storage tanks in the future. These materials have been demonstrated in small-scale tanks; however, no basis for reliable extrapolation to larger scales currently exists. Technology Applications, Inc. and the Colorado School of Mines propose to develop Advanced Granular Systems Modeling (AGSM) software to provide for reliable predictions of detailed mechanical behavior in these applications. AGSM is an innovative approach in modeling the behavior of granular materials through modified distinct element modeling (DEM) combined with a unique experimental validation technique leading to predictions in larger (macroscale) systems currently unattainable. The Phase 1 work plan will focus on the case of microsphere-based cryogenic insulation and is expected to result in a clear correlation in predicted stress concentration trends with respect to system scale and experimental results. In Phase 2, AGSM will be developed to provide predictions of granular material behavior for other materials, containment geometries, and scales to meet the needs of NASA as well as other industrial applications.

Primary U.S. Work Locations and Key Partners



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Organizational Responsibility

Responsible Mission Directorate:

Space Technology Mission Directorate (STMD)

Lead Center / Facility:

Kennedy Space Center (KSC)

Responsible Program:

Small Business Innovation Research/Small Business Tech Transfer

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Organizations Performing Work	Role	Type	Location
★Kennedy Space Center(KSC)	Lead Organization	NASA Center	Kennedy Space Center, Florida
Technology Applications, Inc.	Supporting Organization	Industry	Boulder, Colorado

Primary U.S. Work Locations	
Colorado	Florida

Project Management

Program Director:

Jason L Kessler

Program Manager:

Carlos Torrez

Technology Areas

Primary:

- TX15 Flight Vehicle Systems
  - TX15.2 Flight Mechanics
    - TX15.2.4 Modeling and Simulation for Flight